Tromsö. On this point, too, we are without conclusive proofs, but the examinations have, as already stated, been extended inwards to the mouth of the Balsfjord and its environs, and the results of these disprove such an assumption. Granite blocks are thus to be found about the mouth of the Balsfjord, but in far lesser numbers than over the Troms Island. It is just on the southern part of this island that travelled blocks are found in largest numbers in the whole district; while the circumstance that neither blocks nor fragments of Saussurite gabbro, which, as pointed out, are found in enormous quantities in the neighbourhood of the Balsfjord, can be discovered among the travelled blocks on the Troms Island, further corroborates my belief that no transport of blocks from the Balsfjord outwards to the sea has taken place. In fact, I am fully convinced that the block-transport has taken place *from the coast inwards*.

There is thus every reason to believe that the travelled granite blocks have not been carried out to the Troms Island through the Balsfjord. In fact, there seems more probability that the transport was effected through the Maals River. But, if this was so, travelled granite blocks would have been found on the slopes of the Malang, and here too in decreasing numbers *from the inland towards the outer islands*, which appears, however, not to be the case. I have therefore come to the conclusion that the birthplace of the travelled granite blocks in the vicinity of Tromsö must be referred to the gneiss-granite stratum of the coast, and thus again chiefly to that part of the same which appears at the Kval and Ringvats Islands west of Tromsö. This assumption is supported too by the circumstance that a great number of the travelled blocks, judging by the petrographic composition of the mountains in question, undoubtedly belong to the gneiss-granite of the coast, and that there is nothing to disprove the theory that even the blocks which petrographically seem to differ in composition also belong to the same stratum in composition.

The highest elevation in which the travelled blocks are found in the neighbourhood of Tromsö indicates that the transport of the same has taken place *after* the close of the Glacial period, *i.e.* in an age when the continuous layer of the Ice age had broken up into more or less separated glaciers. Under these circumstances the transport of the blocks from the Kval Island inwards to the Troms Island *must have been effected by floating ice*. The highest line of elevation in which the blocks along the sounds are deposited *indicates, therefore, the height of the sea at the commencement of the block-transport*. And as the blocks are often found in greatest number somewhat below this line, I have come to the conclusion *that block-transport has progressed more rapidly as this period advanced*. I may, however, add that the whole epoch of the block-transport has probably been a short one.

The local conditions of Kval Island seem also to have greatly favoured even the most extensive block-transport at an early age. The continuous layer of ice of the Glacial period has thus, as demonstrated above, been broken up thus early, that the ice remained only in local glaciers of great extent. So early must the block-transport have taken place also in an easterly direction, both through open channels of the Balsfjord and the Kval Sound, and unimpeded by the ice-streams moving down from the mainland. When, however, this, as appears from the blocks in the neighbourhood of Tromsö cannot have been the case, at all events to a limited extent alone, there is herein an obvious proof that special conditions which favoured the current carrying the blocks to the shore did not exist before the epoch which corresponds with the highest level in which the blocks are found.

If the blocks were, as I believe is demonstrated beyond doubt, transported to their places by floating ice, the flow of the currents must have greatly influenced the direction of the block-transport. At a period, therefore, which is determined by the transport commencing eastwards, special conditions must have existed which have caused a stronger flow of the current from the outer coast inwards. There are, in fact, several circumstances which seem to point in this direction. There is in particular that of the Gulf Stream. It is thus evident that the Gulf Stream, which during the Glacial age was diverted from the coast of North Norway, has, in a comparatively recent era, curved towards the coast to a considerable extent.

As is generally known, a complete Arctic Sea fauna existed along the coast of Norway in the early part of the Quaternary age; but by degrees this has been more and more mixed with southern species, an encroachment which continued without interruption to the present time, and is, I believe, still in full operation. Some perfectly pure species of the Arctic fauna may still be met with in some of the deepest fjords of Norway, but even these remains are most probably in retrogression. This constant retrogression of the original Arctic Sea fauna on the coast, and the encroachment of a more southern, must naturally be dependent on currents of warm water coming from the south, and as long as the Arctic fauna alone supervened, these warm currents must have been entirely absent from the coast line referred to in this paper. From the moment access was made for the same, the southern fauna began to manifest itself. In the block-transport here described, which began at a period when the surface of the sea lay, in relation to the fundamental rock, about 30 m. higher than at present, I believe we may find a more exact determination of the time when this curve in the current took place.

There is, besides this circumstance, another of equally great importance which points in the same direction. It is a fact, thus, that fragments of pumice-stone are constantly washed ashore on the coasts of North Norway, and even on those of the Polar lands as far as the Gulf Stream reaches, but pumice-stone is not found at any elevation in Northern Norway, *but only at the lowest by the shore*. In fact, the highest line along which pumice-stone is found here *coincides nearly exactly with that of the travelled granite blocks in the neighbourhood of Tromsö*. In no case does it exceed the same. KARL PETTERSEN

Tromsö Museum, Finmarken, Norway

A NEW FORM OF SPRING FOR ELECTRIC AND OTHER MEASURING INSTRUMENTS[1]

IN steam- and gas-engine indicators the pressure of the fluid on a piston produces a slight shortening of a spiral spring which is magnified by a lever, and so the pressure of the steam or gas is recorded. In what are usually known as spring balances there is also occasionally a magnification of the elongation of a spiral spring effected by the use of a rack and pinion. Such magnifying arrangements, however, not only introduce inaccuracy by the bad fitting of hinges or of teeth, an inaccuracy which is aggravated by wear, but they increase the cost of measuring-instruments and their liability to get out of order.

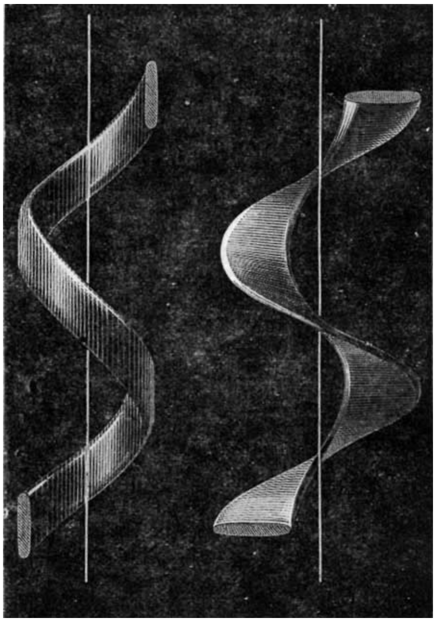

FIG. 1. FIG. 2.

And, as an example of the difficulty of using the wheel and pinion for the magnification of an angular motion produced by a small force, the authors mentioned the fact that although they used this plan for a year or more in their electric measuring-

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[1] Abstract of a paper read before the Royal Society by Profs. W. E. Ayrton, F.R.S., and John Perry, M.E.

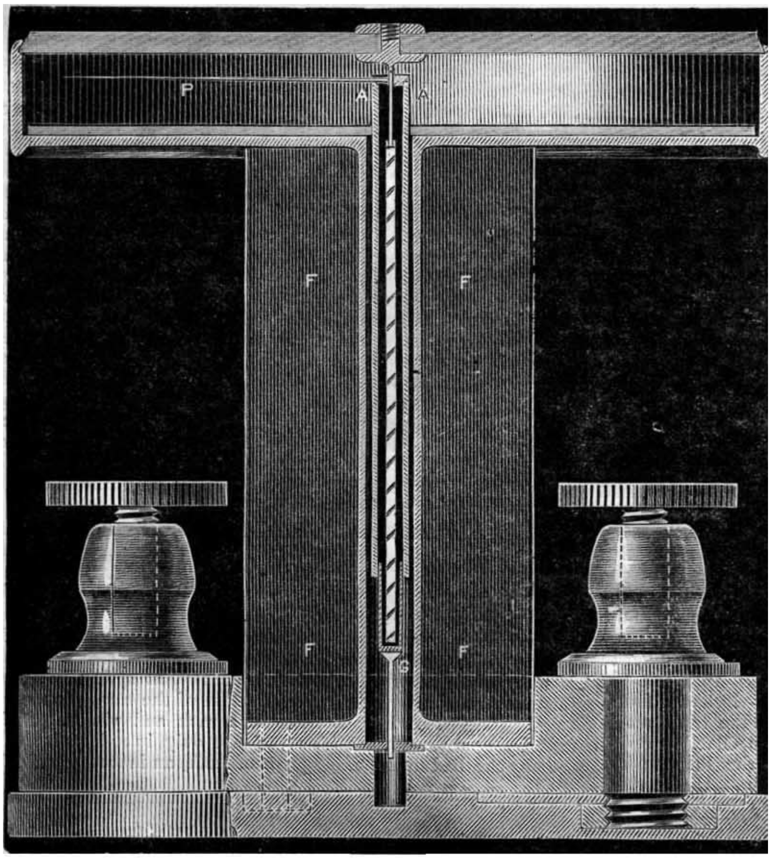

Fig. 3.

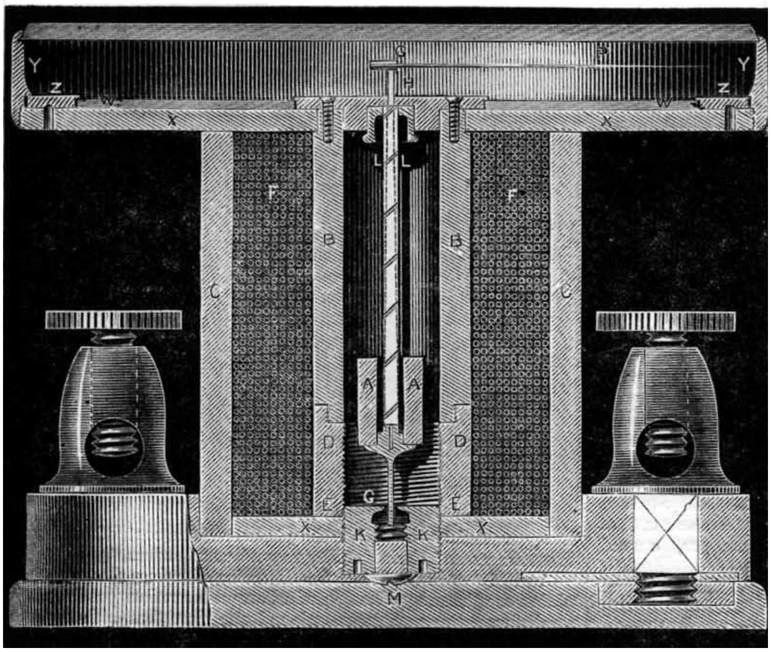

Fig. 4.

instruments, and although the wheels and pinions were made by a good watchmaker, still the friction involved in such a plan has induced them to abandon it in favour of the new arrangement which is the subject of their present communication.

The telescopic method employed by Weber, and the spot of light method due to Sir W. Thomson, for magnifying the effect of an angular motion are, of course, unequalled for stationary measuring-instruments, but for instruments which must be carried about and used quickly without the necessity of adjustment, these most ingenious reflecting methods are quite unsuitable.

With an ordinary cylindric spring, having a small angle between the osculating plane and a plane perpendicular to the axis, as is the case with all spiral springs such as are in practical use, it is well known that but very little rotation is produced between its ends by the application of an axial force. Consequently with such springs it is only possible to obtain magnification by the employment of a system of levers, or of a rack and pinion. It occurred to the authors, therefore, to consider whether it would not be possible to make a spiral spring of such a nature that for a comparatively small axial motion of its ends there should be considerable rotation of one end relatively to the other, and by the employment of which all levers, racks, and pinions could be dispensed with, so that no error could be introduced by wear and tear, or by want of fitting of joints, and further so that the temperature correction should be merely one affecting the rigidity of the material used as a spring, and not a correction such as had to be applied in consequence of the contractions and expansions of the various parts of an ordinary magnifying apparatus.

The theory of the strength and stiffness of the ordinary cylindric spiral spring of small angle was given for the first time in 1848 by Prof. James Thomson, and the authors follow his method in investigating the laws governing the behaviour of spiral springs generally. They find that if the centres of all cross-sections of the wire, or strip, forming the spring lie on a right circular cylinder of radius r; if the spiral have everywhere an inclination α to the plane perpendicular to the axis of the cylinder, and if a force F act at one end of the spring along the axis, the other end of the spring being fixed; if B is the flexural rigidity of the wire in the osculating plane, and if A is the torsional rigidity about the spiral line at any place; if the angular motion, in a horizontal plane, of the free end of the spring relatively to the fixed end be called ϕ, and if the axial increase of length be called d, and the whole length of the spring along the spiral l, then—

$$\phi = l \, \mathrm{F} \, r \sin\alpha \cos\alpha \left(\frac{1}{\mathrm{A}} - \frac{1}{\mathrm{B}}\right) \quad . \quad . \quad (1),$$

and

$$d = l \, \mathrm{F} \, r^2 \left(\frac{\cos^2\alpha}{\mathrm{A}} + \frac{\sin^2\alpha}{\mathrm{B}}\right) \quad . \quad . \quad (2).$$

Assuming for the general investigation that the cross-section of the wire is elliptic, it is found that the rotation of the free end of a spring like Fig. 1 or Fig. 2 is greater the greater the inequality in the principal diameters of the elliptic section.

In Fig. 1 it is found that there is an uncoiling on the application of an axial pull. Fig. 2 shows a spring made of the same material, but the wire has been passed through rolls so as to flatten it in the opposite way, and now a rotation tending to coil it up is found to be produced by the application of an axial pull.

The twisting torque to which the spring is subjected is F r cos α, and the bending torque to F r sin α. But the twist must be multiplied by sin α, and the bend by cos α when we project these motions on a horizontal plane. So far then as the total rotation in a horizontal plane of the free end of the spring relatively to the fixed end is concerned, it may be regarded as being produced by equal twisting and bending torques, each of them equal to F r sin α cos α; and the total rotation of the free end of the spring relatively to the fixed end, which is the special feature of the springs considered, is proportional to the difference between the two angular rotations produced in the wire by these equal bending and twisting torques. The twist alone would cause an increase in the number of coils, that is, a rotation in the direction of coiling which is the positive direction, while the bending, or rather the unbending, alone would cause a negative rotation, or one tending to uncoil the spring. When both occur together in the actual spiral spring subjected to an axial force, the total rotation is positive or negative, according as the angular twist or the angular bend is the greater. Hence the flexura and torsional rigidities of the wire alone determine whether the rotation is positive or negative.

It is well known, for example, that, when a wire of circular section is subjected to equal twisting and bending torques, the twist is greater than the bending for almost all substances, that is, substances in which the ratio of the modulus of rigidity to Young's modulus is between one-third and one-half. Hence we may expect that in a spring made of round wire, and with the spires making an angle of 45° with a plane perpendicular to the axis, the total rotation will be positive for an axial force applied so as to lengthen the spring. And experiment shows that this is the case.

If the wire be flattened and bent so that the flat side of the strip touches the cylinder on which the wire is coiled, as shown in Fig. 1, then the arrangement is such that the bending is greater than the twist. Hence an axial force applied so as to lengthen this spring causes a negative rotation, whereas if the strip be coiled as in Fig. 2, so that the edge of the strip lies against the cylinder on which it is coiled, an axial force similarly applied will now cause a positive rotation. It is almost certain that for any strip of material the positive value of ϕ obtained with the latter form of spring is likely to be greater than the corresponding negative value with the former kind, but the difficulty of manufacturing the second form of spring compelled the authors to confine their attention to the former type.

Having constructed some very delicate springs of the first kind, one of the first difficulties which the authors met with arose from the liability of such springs to acquire a permanent set, so that it became necessary to determine the dimensions of the spring which would give the largest amount of rotation with the minimum amount of stress in the material. Having made their calculation of the greatest amount of stress, the general conclusions arrived at are, that in order, with a given axial force, to obtain a large amount of turning of the free end of the spring, combined with small maximum total stress in the material, and not too much axial motion of the free end of the spring, the strip of elliptic section should be as long and as thin as possible, should be wound in a spiral such that the osculating plane makes an angle of 40° to 45° with a plane perpendicular to the axis of the spiral, and so that the smaller diameter of the elliptic section is at right angles to the axis of the spiral.

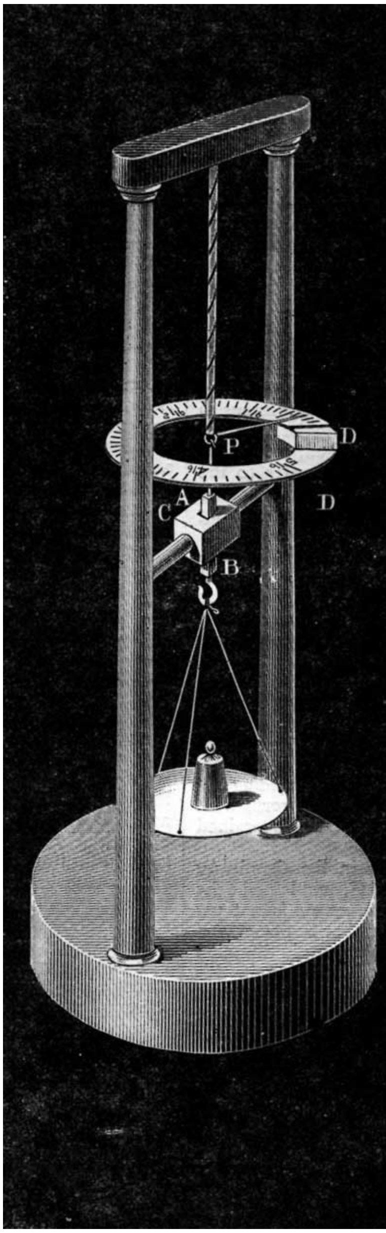

Fig. 5.

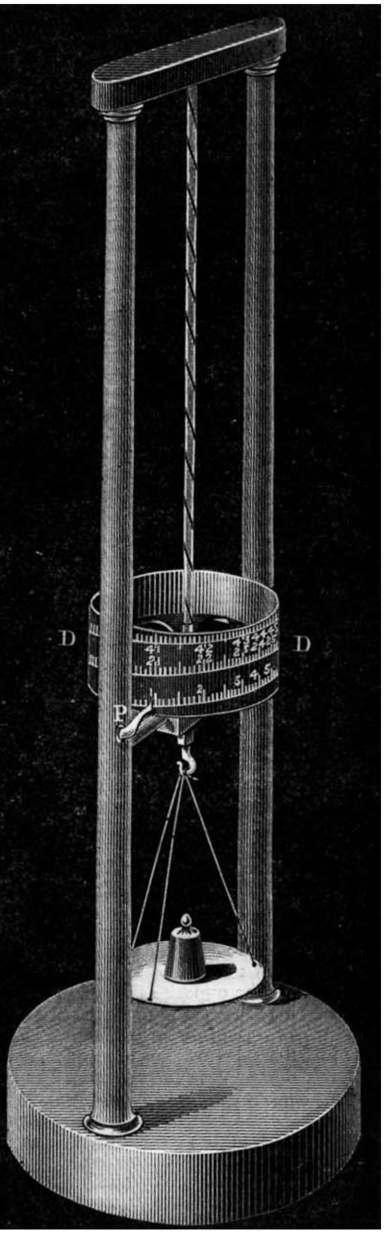

Fig. 6.

In the springs employed by the authors in measuring-instruments the edges of the strip nearly touch one another in consecutive coils, so that the strip forms almost a continuous cylindric surface; the angle of the spiral being 45°, the cross-section of the strip being rectangular, and they find the following laws:—

$$\phi \propto \frac{l\mathrm{F}}{t^3}\left(\frac{1}{4\mathrm{N}} - \frac{1}{\mathrm{E}}\right)$$

$$d \propto \frac{l F r}{b^3}\left(\frac{1}{4 N} + \frac{1}{E}\right)$$

$$f \propto \frac{F}{b^2}$$

where f is the greatest stress in the material, b the thickness of the strip, N the modulus of rigidity, and E Young's modulus for the material.

The authors now show how their springs may be used to determine directly the ratio of the modulus of rigidity of a material to its Young's modulus, and they conclude their paper by describing some practical applications of their springs which they have already made in measuring-instruments. Thus by the employment of springs such as those described, they have succeeded in making *ammeters* and *voltmeters*, or instruments for measuring respectively electric currents and differences of potential, in which the pointer moves over in some cases as much as 270° of the scale instead of only 50°, which is all that can be obtained with ordinary galvanometers. One form of the instrument is shown in Fig. 3, where A A is a thin, hollow tube of charcoal iron attached at its lower end to a brass piece G guided at the bottom in the way shown. To G is attached the lower end of a spring made in the way described, of silver or hard phosphor-bronze, the upper end of which is attached rigidly by a thin rod to the glass top of the instrument, which itself is fastened rigidly to the framework of the instrument. The rod attached to the glass, and to which the upper end of the spring is attached, also serves as a guide to the top of the iron tube. In the space F F a solenoid wire or strip is wound, its ends being attached to the terminals shown. Hence, when a current is passed through the wire, the iron tube is sucked into the solenoid, and its lower end G, to which the spring is attached, receives a large rotatory motion, which is communicated directly to the pointer attached to the top of the iron tube. Parallax in taking readings of the pointer is avoided by the horizontal scale being on looking-glass in the well-known way.

By making the iron tube A A very thin, so that it is magnetically saturated for a comparatively weak current, by fixing it so that it projects into the solenoid a fixed distance which has been carefully determined by experiment, and by constructing the spring in conformity with the conditions worked out in this paper, so as to obtain a large rotation with minimum stress, and with not too much axial motion of the free end of the spring, they have succeeded in obtaining deflections up to 270° directly proportional to the current, and without any permanent set being given to the spring.

To prevent a spring taking a permanent set for a large deflection, it is of great importance that the spring after being delivered by the maker should receive a large degree of permanent set in the direction in which we wish it to be afterwards strained in ordinary working.

In spite of the fact that Prof. J. Thomson in the *Cambridge and Dublin Math. Journ.*, November 1848, explained the importance of initial strains in materials, the reason is not yet sufficiently well understood why when a round bar has been well twisted beyond the limit of permanent set in a certain direction it has twice as much elastic strength to resist torsion in this direction as in the opposite direction. Now in the very act of manufacturing these springs, that is in the bending of the strip, the material acquires strains which are just opposite in character to the initial strains which we wish it to possess, for, as already explained, if the spring be constructed as in Fig. 1, an extension of the spring produces a rotation tending to uncoil it. Hence a spring must not be regarded as ready for use until it receives a good set by means of a weight hung from its end.

This instrument is *direct reading*, the adjustment for sensibility being made by a small sliding coil, the correct position of which is initially determined experimentally by the makers, and in which position the coil is permanently fixed.

Theory of the Solenoid Spring Ammeter or Voltmeter.—If C is the current in amperes flowing through the coil, the attractive force on the iron core is

$$\frac{K C^2}{1 + S C},$$

where S is a constant, which is the greater as the current is smaller for which the iron tube A A, Fig. 3, becomes saturated with magnetism. The position of this iron core in the solenoid is so selected that K remains practically constant throughout the small range of downward motion of the core.

Since the rotation ϕ has been produced by an axial force, we know from the theory of the spring already given, that this axial force is $p\,\phi$, where p is some constant. Hence

$$p\,\phi = \frac{K C^2}{1 + S C},$$

and since S C is great in comparison with unity for such currents as we wish to measure, we have

$$\frac{p\,\phi}{K} = \frac{C}{S} - \frac{1}{S^2},$$

or

$$C = \frac{S p}{K}\phi + \frac{1}{S},$$

that is, equal divisions of the scale correspond with equal additions to the strength of the current except close to the zero, and the authors do not usually graduate these instruments within 5° of the zero.

Shielded Measuring-Instruments.—When it is desired to use the instrument close to a dynamo machine or electromotor in action, they have adopted a different and somewhat special form of construction, which is shown in Fig. 4, by means of which the instrument is to a great extent shielded from even powerful external magnetic fields. In this instrument the electromagnet consists of a hollow core, part of which, B B, is of charcoal iron, and part, D E, of brass, or other non-magnetic metal. The outside tube, C C, and the plates, X X, top and bottom, are also of charcoal iron. The space F F is filled with insulated wire or strip in electric connection with the terminal, so that when a current is sent through the instrument an intense magnetic field is formed between D and E, which are the poles of the electromagnet. To the iron tube A A, also made of charcoal iron, the spiral spring, in this case made of extremely thin hard steel, is attached, the other end being attached to the piece F, which is fixed relatively to the bobbin. The spindle G G, which is fixed to the moving iron core A A, moves freely in bearings H H, so that the only movements of which A is capable are one of rotation and one parallel to the axis of the bobbin. As the iron core A projects into the strong magnetic field between D and E, it is strongly attracted towards E when the current flows, and, as before, causes a large rotation of the pointer P over the scale. As a means of varying the power of the instrument an adjustable iron piece K is provided, which can be screwed nearer to or farther from the core A, and by the use of which the sensibility of the instrument can be adjusted so as to make the instrument "direct reading," that is to say, each division of the scale can be made to correspond with 1 ampere of current, or 1 volt difference of potential, and the employment of a constant such as 1·34 amperes, or volts, per degree, which has hitherto been necessary with our measuring-instruments, is now avoided. This power of adjustment produced by the use of the movable iron piece K, combined with the ease with which more or less wire can be wound on to the instrument, which also constitutes a second adjustment of sensibility, is of considerable importance, since the employment of a constant has not only led to error and delay in measurements made in electric-light factories, but has caused the breakage of the pointer or the destruction of an instrument from a far too powerful current being sent through it by an observer (often a man with little experience in the employment of instruments) having confounded the constant of some other instrument with that of the one he was using.

In the first of these magnifying spring ammeters and voltmeters made by the authors, the instrument did not show the *direction* of the current, but they have since added on the base of the instrument a small compass needle (not seen in the accompanying illustrations), which points out at which of the terminals the positive current enters, while the main pointer of the instrument shows as before the magnitude of the thing to be measured.

Weighing-Machines.—Another class of instruments in which they have practically employed this spring are weighing-machines, and Fig. 5 shows one of the arrangements adopted. The scale-pan is prevented from turning by the part A B being square and fitting very loosely a square hole in C. This arrangement introduces practically no friction, and prevents the moment of inertia of the scale-pan and load interfering, by means of a rotatory motion, with the rapidity with which the pointer comes to rest when a load is put into the pan. The position of the pointer P, which revolves when a weight is placed in the scale-pan, is read off upon the spiral scale D, which in the specimen shown was graduated in pounds. In another of these weighing-machines, shown in Fig. 6, the arrangement is the same with the exception that a cylindric scale D is fixed to the end of the spring and turns with it; the pointer P fixed on the frame of the instrument points to an indication of the weight on a spiral line drawn on the cylinder D. This second arrangement allows of the employment of springs whose ends have a relative motion of five or six revolutions.

The authors also brought before the Royal Society a model showing a combination of bifilar and spiral spring suspension, in which great rotation and small axial lengthening or shortening are produced by an axial force.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

CAMBRIDGE.—Mr. A. E. Shipley, of Christ's College, will give a repetition of the Elementary Biology course in the Morphological Laboratory during the Long Vacation, beginning July 7.

The workshops of Mechanism will be open during the Long Vacation.

The Observatory Syndicate report 2305 observations of R.A. and N.P.D. in 1883-84, including 1579 observations of zone-stars made on 100 nights. The observations of standard stars are reduced to about the end of 1883. The zone-stars are completely reduced to end of 1881, the mean R.A. and N.P.D. to end of 1877.

It appears that the new expenditure entered into for professors, readers, University lecturers and demonstrators, and for apparatus and buildings, already exceeds the annual receipts from the colleges under the recent Act. Thus there is little chance at present of the appointment of the numerous readers contemplated by the University Commissioners.

The placing of a new story over the Mineralogical Museum for a laboratory of Elementary Biology has been sanctioned. The recommendations regarding a lecture-room and additions to the Physiological Laboratory are in abeyance.

The Botanic Garden Syndicate reports that during the past year the houses have been improved in many details. The Bromeliaceæ are now represented by fifty species. A new fern pit for filmy ferns is well stocked. The collection of Irises has been greatly improved, largely by Prof. Michael Foster's generous contribution, making it probably the finest in any botanic garden. The liberality of Mr. Barr has contributed a very fine collection of daffodils, and one of Funkias, not surpassed anywhere. Numerous plants of scientific interest have flowered in the Gardens and been figured. Col. T. Clarke has contributed a set of important Croci; Messrs. Low of Clapton a fine set of orchids.

The local lectures in provincial centres continue to gain large audiences, many courses of lectures on physical science and biology being given. Great difficulty, however, is felt in establishing sufficiently continuous courses of lectures in successive years, so as to give complete schemes of study.

The Cavendish and the Chemical Laboratories will be open during July and August.

Prof. Macalister will hold a class in Osteology during the Long Vacation. The Demonstrator will take a class in Practical Histology.

SCIENTIFIC SERIALS

THE *Journal of Botany* for May contains several articles of interest to cryptogamists:—Mr. W. B. Grove describes a number of fungi, some of them but little known or new; and the paper is illustrated by two plates.—Mr. S. Le M. Moore has paid special attention to the small class of endophytic algæ, and gives some interesting particulars regarding the structure and reproduction especially of *Chlorochytrium Lemnæ* and *Scotinosphæra paradoxa*.—Dr. Hance describes, under the name *Ptilopteris*, a new genus of polypodiaceous ferns; and Mr. J. G. Baker several new species of ferns in the collection of M. Humblot from Madagascar.—Among the minor notes evidence is given that *Centaurea Jacea*, L., must be regarded as a true British species.

In the number for June the only original article of importance is an exhaustive monograph by Mr. F. Townsend, of the variable species *Euphrasia officinalis*. He classifies the various forms under eight groups, only three of which are found in the British Islands.—A large portion of this number is occupied by the completion of the annual list (continued from the previous number) of new flowering plants published in periodicals in Britain during 1883. The length of this list affords evidence that the study of descriptive and systematic botany is not altogether neglected in this country.

Rendiconti del R. Istituto Lombardo, May 15.—Biographical notice of Giovanni Polli, with a list of his scientific productions, by Prof. Gaetano Strambio.—Influence of Virgil on the style of Dante, Petrarch, Metastasio, and Parini, by E. Giulio Carcano.—On the present condition of agricultural interests in Europe and North America, by Prof. Gaetano Cantoni.—On surfaces of the third order, by Prof. E. Bertini.—Experimental studies on the cure and prevention of tuberculosis, by Prof. G. Sormani.

Journal de Physique, April.—E. Blavier, study of earth-currents. In France these currents generally flow from north-west to south-west, and inversely; but often their direction changes and they go from north to south, north-east to south-west, east to west, or inversely. It is still impossible to give a general law.—E. Mascart, on the reciprocal action of two electrified spheres, shows that if the distance between centres is triple the diameter the law of Coulomb is correct to 2 per cent.—M. Brillouin, duration of swing of a magnetic system with its index.—M. Izarn, electro-dynamic and electro-magnetic experiments. An astatic float based upon that of Ampère is used to demonstrate the law of repulsion of consecutive elements of the current. The apparatus does not disprove Maxwell's view, however.—M. Buguet, action of two consecutive portions of one current.

May.—E. Mercadier, on the laws of transverse vibrations of elastic rods. From experiments on rods of steel and iron held at two points it appears that the number of vibrations is proportional to the thickness in the direction of the displacement, inversely proportional to the square of the length, and independent of the breadth.—P. Garbe, on Joule's law. Experiments made with an incandescent lamp placed in a calorimeter.—M. Marey, analysis of movements of photography. Gives a diagram of movements of a man running.—E. Mathieu, figures of liquid drops at the moment when they are about to detach themselves from a capillary tube fastened to the bottom of a vase.—M. Neyreneuf, on the transmission of sound.

Bulletin de l'Académie R. de Belgique, April 5.—Investigations on the spectra of the comets and on the luminous spectra of the hydrocarbonic gases, by Nicolas von Konkoly.—On the presence of the Biscay whale (Nordcaper) on the coasts of Norway in ancient and modern times, by G. A. Guldberg.—On the influence of temperature on the bands of the spectrum, by Ch. Fievez.—On the sand-heaps and sandstone boulders scattered over the Upper Devonian hills in the Sambre and Meuse districts, by Michel Mourlon.—On the influence of the atmospheric conditions on the appearance of certain colours in the scintillation of the stars; application of these observations to the prediction of changes of weather, by Ch. Montigny.—Spermatogenesis in *Ascaris megalocephala*, by Edouard Van Beneden.—On the advanced state of vegetation in Belgium in the month of March, 1884, by G. Dewalque.—Remarks on the cause of metamorphism in the rocks of the Recogne district, Luxemburg, by Jules Gosselet.—On the existence of a fourth species (*Balænoptera borealis*) of the genus Balænoptera in the North European waters, by G. A. Guldberg.

Journal of the Russian Chemical and Physical Society, vol. xvi. fasc. 3.—On the formation of amides of ammoniacal salts, by N. Menschutkin. The speed of amidation of the investigated acids increases with the increase of temperature, and the influence of temperature could be represented by similar curves for the different acids. The velocity of amidation depends also on the molecular weight, that of formic acid going on at a greater speed than those of acids which have higher molecular weights. Even with the aromatic acids the speed of amidation depends on the isomeric form of the acid. The results as to the dependency on isomerism and molecular weight are identical with those arrived at with regard to the compound ethers.—On the hydrates of the chloride of cobalt, and on the cause of the changes of colour of its dissolution, by A. Potilitzin.—On the action of the haloid salts of aluminium on the saturated hydrocarbons, by G. Gustavson. Organic bodies undergo great modifications when they enter into reactions with these salts, even when they enter into unstable temporary combinations; they acquire the capacity of entering into several new reactions, and undergo deep modifications even without being heated. The experiments might throw a new light on the part played by mineral salts in organisms, the component parts of which may be thus submitted to changes that are favourable for life.—On a new salt of rhodium, by Th. Wilm.—Note on M. Kanonnikoff's memoir on the refracting power of organic substances, by F.